South Carolina
End-of-Course Examination
Program

Teacher's Guide

Algebra 1/Mathematics for the Technologies 2 Examination

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Contents

Introduction

The South Carolina Education Accountability Act (EAA) of 1998 requires that end-of-course examinations be administered to students in grades nine through twelve in gateway courses. In order to fulfill this EAA mandate, the State Department of Education (SDE) has instituted the South Carolina End-of-Course Examination Program (EOCEP). The examinations that are developed and administered through this program will cover the following courses: Algebra 1/Mathematics for the Technologies 2, English 1, Physical Science, Biology 1/Applied Biology 2, and U.S. History and Constitution. All students enrolled in each of these EOCEP courses will take the corresponding test when the program is fully implemented. In addition, the Instructional Leaders Roundtable—a panel that consists of one representative from each school district—has agreed that end-of-course tests will also be administered in other courses that may have a different name from those listed above but that include the Algebra 1 content standards.

All students who complete any of the EOCEP courses, whether the course is unit-bearing or not, are included in the testing program.

The purposes and uses of the EOCEP tests are the following:

A. The tests will promote instruction in specific academic standards for the particular courses, encourage higher levels of student achievement, and document the level of students' mastery of the curriculum standards.

B. The tests will serve as indicators of program, school, and school district effectiveness in the manner prescribed by the Education Oversight Committee in accordance with the provisions of the EAA.

C. The tests will be weighted 20 percent in the determination of students' final grades in the gateway courses. The schedule for the phase-in for the 20 percent provision will be provided by the SDE. The Algebra 1/Mathematics for the Technologies 2 test will count as 20 percent of each student's final grade in the appropriate course beginning in December of 2003.

The South Carolina end-of-course examinations are multiple-choice tests based on written test specifications that are directly linked to the South Carolina curriculum standards. The test questions are designed and constructed to specifically assess these skills, abilities, and/or knowledge. Care is taken in creating possible responses since a well-constructed multiple-choice question has only one correct answer along with incorrect options that represent common errors in reasoning. The test questions are not meant to be tricky but rather are designed to distinguish between those students who understand the concept or skill being tested and can apply their understanding and those students who have an incomplete understanding of the concept. Students who understand the concept will likely choose the correct option, while those with an incomplete understanding will likely choose an incorrect option because it is based on a common misconception and thus seems plausible to such students.

All test items are carefully reviewed by content experts, language and testing experts, and South Carolina Content Review Committee members to ensure that each test question properly measures the intended standard. Test questions also are carefully reviewed so that test-wise students cannot find unintended clues to the correct option. In addition, the South Carolina

Sensitivity Review Committee reviews the test to ensure that each question not only is free from bias with respect to race, gender, ethnicity, socioeconomic status, culture, and geographic region but also is free of content that would be offensive to any cultural, religious, or ethnic group. The examination is then field-tested to further ensure item validity.

This teacher's guide for the Algebra 1/Mathematics for the Technologies 2 end-of-course examination has been developed to provide educators with important information about this examination and to explain how it can be used effectively to strengthen the teaching and learning of algebra in South Carolina. The guide provides a description of the test that encompasses its purpose and structure, its role in the EOCEP, and the course standards that guided its development. Also provided here are sample questions for each subdomain assessed as well as practical suggestions for preparing students for the examination and for using the examination to raise student achievement levels in algebra. In the Algebra 1 content standards, the major topics that have roman numerals beside them are referred to as "domains." The subtopics under these domains, labeled with capital letters, are referred to as "subdomains."

You are urged to review the material in this guide carefully. It will help you in the ongoing process of improving teaching and learning in South Carolina.

If you wish to read the State Board of Education regulation about the EOCEP\ (R 43-262.4, "End-of-Course Tests"), a link to the document is provided on the Office of Assessment's Web site at http://www.sde.state.sc.us/new_site/offices/assessment//Programs/endofcourse/index.htm. A brief summary of the major components of the EAA is provided on the SDE's Web site at http://www.sde.state.sc.us/archive/ednews/1998/98accact.htm.

PART 1

Overview of the Examination

The test questions on the Algebra 1/Mathematics for the Technologies 2 examination are aligned with the South Carolina Algebra 1 course standards and are designed to assess students' mastery of these standards. These course standards—and therefore the examination questions—are divided into three domains: Understanding Functions, Linear Functions, and Quadratic and Other Functions. (See the appendix for the complete text of the South Carolina Algebra 1 course standards.)

The Algebra 1/Mathematics for the Technologies 2 examination is composed of fifty test items. Students are given enough time in the testing session to attempt every question on the test. All of the questions are in the multiple-choice format.

As you review the sample test questions in part 2 of this document, you will see how each question has been constructed to assess a specific skill or ability within a particular subdomain of each of the three domains listed above.

Basic Questions Teachers Have about the Examination and the EOCEP

Who decided what the examination will cover?

The examination is based on the Algebra 1 course standards that are set forth in the *South Carolina Mathematics Curriculum Standards 2000*. A committee of South Carolina educators and leaders developed these standards, and questions to measure students' mastery of these standards were developed specifically for this examination.

Who will take this examination?

All students scheduled to complete Algebra 1 or Mathematics for the Technologies 2 for credit toward a high school diploma will take this examination. The majority of the students taking this particular text will be in grades eight through ten. Adult education students and home-schooled students who are pursuing a high school diploma will also be included in the testing program. The test will be administered only to students who are scheduled to complete either Algebra 1 or Mathematics for the Technologies 2 for high school credit.

How will home-schooled students be tested?

Home-schooled students should take the test during the first regular testing window following their completion of the course. The end-of-course tests are part of the statewide testing program, and home-schoolers approved by the district are required to participate. The districts monitor the performance of each home-schooled student.

Why do students have to take this examination?

The EOCEP is being developed in response to the EAA, which requires the development of end-of-course examinations in the gateway courses for grades nine through twelve. These examinations serve as indicators of program, school, and school district effectiveness, promote instruction in specific academic course standards, and encourage higher levels of student achievement. They may be used as final examinations for these courses. The test scores must comprise 20 percent of the students' final grades in these courses.

What accommodations will be offered for students with disabilities?

Accommodations, modifications, and customized materials are available for the EOCEP for students with documented disabilities. For South Carolina assessment programs, the term "accommodation" is defined as a change in the testing environment, procedures, or presentation that does not alter in any significant way what the test measures and does not affect the comparability of scores. The purpose of accommodations is to enable students to participate in testing in a way that allows assessment of their knowledge and skills rather than their disabilities.

The following are examples of permissible testing accommodations:

setting—small-group or individual administration, special lighting or furniture

timing—extended time, afternoon administration, frequent breaks in testing

scheduling—administration of the test over several sessions or several days

response options—alternate response modes, such as responding in the test booklets, using bold-line paper, typing responses, and nonverbal responses

Modifications are available as appropriate. The term "modification" refers to any change in the testing process that compromises the validity and alters the meaning and comparability of the test scores. Modifications are appropriate only for those students with disabilities who, owing to the nature of their disabilities, are unable to take the examination without modifications. The testing modifications should be the same as the modifications used by the student in routine instruction and assessment. Appropriate customized materials such as large-print, braille, and script versions will be available, as needed, for operational (i.e., nonfield-test) administrations of the end-of-course examinations.

Will a calculator be allowed during testing?

The EOCEP calculator policy appears on the Office of Assessment's Web page at http://www.myscschools.com/offices/assessment//Programs/endofcourse/CalculatorUsePolicy.htm. In brief, this policy is that even though the test items are written so that a calculator is not required, students are allowed to use a calculator on the examination.

Graphing calculators are permissible. However, graphing calculators that use symbolic manipulation capability—such as the Casio FX 2.0, the Hewlett Packard HP-40g or HP-49g, or the Texas Instruments TI-89 or TI-92—*may **not** be used*. Likewise the following types of calculators *may **not** be used*: pocket organizers; Palm Pilots, Visor, or other Palm-based devices; handheld PCs that use a writing tablet or QWERTY (typewriter) keyboard; and calculators that "talk" or otherwise make noise, such as the AudioCalc.

Teachers may provide calculators, according to school policy, for students to use during the examination. These calculators must conform to the above restrictions, however. In addition, to maintain test security, the test administrator *must* make sure that the memory of every test taker's calculator has been cleared *before and after* the test. This safeguard will prevent students from bringing answers in with them to take the test and from taking secure test items out with them when they leave the testing room.

Is the test timed?

The test is not timed. It will be administered in a test session of approximately ninety minutes, which should be sufficient time for all students to have the opportunity to attempt every question on the test. Test administrators are instructed to make every effort to give all students sufficient time to complete the test.

How will the scores from the EOCEP be factored into students' grades?

The results of the Algebra 1/Mathematics for the Technologies 2 examination will be used, beginning in the 2003–04 school year, as 20 percent of a student's final grade in the course. Individual EOCEP scores will be reported on the South Carolina uniform grading policy. The score reported is a scale score and not the percent correct.

As a teacher, what are my responsibilities with regard to the EOCEP?

On the first day of class, all students taking a course assessed by the EOCEP must receive a copy of the curriculum standards for that course. Teachers should incorporate these standards and the appropriate course content into their classroom curriculum. Part 2 of this guide contains sample examination questions for certain of these standards. These samples are intended to help you and your students become familiar with the style of the questions on the test.

The primary responsibility of teachers with regard to the EOCEP is preparing their students for the test by ensuring that they understand the major concepts of algebra and are able to express that understanding. Ongoing daily teaching strategies such as asking probing questions and requiring written explanations, along with student-teacher and student-student dialogue, contribute to this understanding more than multiple-choice practice items do. Having students collect and analyze data, illustrate graphically (both by hand and with graphing technology), and explain their thinking orally and in writing are excellent tools to prepare students to perform well on the end-of-course examination.

PART 2

Ten Sample Test Questions

This section contains ten sample test items that are representative of the questions used on the Algebra 1/Mathematics for the Technologies 2 end-of-course examination. These ten questions, one from each of the ten subdomains that are assessed, are only a sample of what students should expect to encounter on the actual examination. The items illustrate the format, type, and approximate level of difficulty of the examination questions. For each sample question, the relevant domain, subdomain, and standard are identified. The text describes what content the item is testing, what the student should know to be able to answer the item, and what errors students most commonly make.

It is important to remember that the different forms of the examination will contain different items that assess the same standard. In addition, the different forms will contain items within each subdomain that assess different standards. The complete listing of the Algebra 1 course standards appears in the appendix.

SAMPLE QUESTION 1

Strand: I. Understanding Functions

Substrand: A. Relationships

Standard: 1. Describe independent and dependent quantities in functional relationships.

1. For her science class, Kaitlin recorded the length of her shadow every hour for five consecutive hours during a day.

Which of the following is the dependent variable in this situation?

A. time of day

B. five hours

C. length of shadow

D. Kaitlin's height

Key: C

This item requires the student to recognize the dependent variable in an applied situation. The student must understand that the dependent variable is the one that depends on another variable in the situation. Kaitlin records the length of her shadow, which depends on the time that has passed. Time is the independent variable because it passes independently of what is happening to the length of her shadow.

Common errors include selecting the independent variable, the initial value for the situation, or the entire domain of the situation. Other items for this standard may ask students to identify the independent variable in a relationship. The applied situation may be represented in a graph.

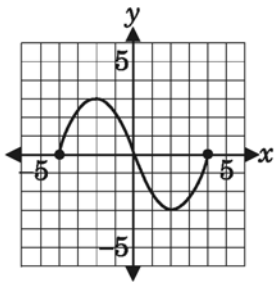
SAMPLE QUESTION 2

Strand: I. Understanding Functions

Substrand: B. Linear and Quadratic Functions and Data Representations

Standard: 2. For a variety of situations, identify and determine reasonable domain and range values for given situations.

2. A function is graphed below.



What is the domain of this function?

A. $-3 < y < 3$

B. $-4 \leq y \leq 4$

C. $-3 \leq x \leq 3$

D. $-4 \leq x \leq 4$

Key: D

This item requires the student to determine the domain of a function from a graph. The domain includes all possible values for x for which the function is defined and makes sense. The student must recognize that the endpoints of the continuous function are at $x = -4$ and $x = 4$, so that the domain is $-4 \leq x \leq 4$.

Common errors include finding the range instead of the domain. A student failing to recognize that the domain represents possible x values for the function may incorrectly choose option A or option B. Other items for this standard may ask the student to find the range or determine reasonable values of domain and range based on an applied situation.

SAMPLE QUESTION 3

Strand: I. Understanding Functions

Substrand: C. Generalizations, Algebraic Symbols, and Matrices

Standard: 4. Use symbolic representation, reasoning, and proof to verify statements about numbers.

3. Let x be any real number. Then the statement $x^3 > 0$ is true for

A. $x > 0$ only.

B. $x < 0$ only.

C. no values of x.

D. all real values of x.

Key: A

This item focuses on what happens when numbers are cubed. The student must recognize that x^3 is positive when x is positive and is negative when x is negative.

Common errors include thinking that cubing a number results in a positive number, as squaring a number does, or thinking that raising a number to the third power is the same as multiplying the number by 3.

SAMPLE QUESTION 4

Strand: I. Understanding Functions

Substrand: D. Algebraic Expressions in Problem Solving Situations

Standard: 6. Use the commutative, associative, and distributive properties to simplify algebraic expressions.

4. Which expression is equivalent to $(2x - 5) - (3x - 8)$?

A. $-x - 13$

B. $-x + 3$

C. $2x - 16$

D. $5x - 3$

Key: B

This item focuses on using the distributive and associative properties to simplify an expression. For this standard, a problem-solving situation includes this type of item. The student must understand that subtraction of a quantity in parentheses is the same as distributing –1 over the terms in the parentheses, grouping like terms together, and combining like terms.

Common errors include not distributing the –1 to both terms in the parentheses or incorrectly combining like terms. Other items for this standard may ask students to simplify or identify equivalent representations of other algebraic expressions by applying the commutative, associative, and distributive properties.

SAMPLE QUESTION 5

Strand: II. Linear Functions

Substrand: A. Representations

Standard: 1. Determine whether or not given situations can be represented by linear functions.

5. Which of the following situations is best represented by a linear function?

A. The amount Jeremy tips at a restaurant is a function of the total bill. He tips 15% of the total bill.

B. The rate that carbon deteriorates is a function of time. Carbon deteriorates by one-half every 5,700 years.

C. The distance a ball travels after being dropped is a function of acceleration and time. The distance is one-half of the acceleration multiplied by the square of time.

D. The value of a savings account is a function of time. The value of the account increases by 3% every year.

Key: A

This item requires the student to recognize the difference between linear and nonlinear functions in applied situations. The student must understand that a linear function is one that changes by a constant amount for each equivalent interval. For example, since the tip is a constant 15 percent of the total bill, the tip changes the same amount (15 cents) for each additional dollar of the bill. In each of the other options, the rate of change is not constant over time and therefore does not describe a linear function.

Common errors include thinking that an increase by a constant amount that is multiplied (e.g., 3 percent increase each year) represents a linear function. Other items for this standard may ask students to identify situations that *cannot* be represented by a linear function.

SAMPLE QUESTION 6

Strand: II. Linear Functions

Substrand: B. Interpretations

Standard: 4. Graph and write equations of lines given characteristics such as two points, a point and a slope, or a slope and *y*-intercept.

6. Which equation represents the line passing through the points (–2, 4) and (2, 8)?

A. $y = -x + 2$

B. $y = -x + 6$

C. $y = x + 4$

D. $y = x + 6$

Key: D

This item requires students to identify an equation for a line based on two points. The student must correctly determine the slope by computing

$$\frac{\text{change in y}}{\text{change in } x} = \frac{8-4}{2-(-2)} = 1$$

or by graphing the points. The student must then solve for the *y*-intercept. Finally, the student must use the slope and the *y*-intercept to identify the equation $y = x + 6$ as the correct answer.

Common errors include miscalculating the slope as run over rise, substituting the coordinates of a point incorrectly into the equation $y = mx + b$ or $y - y_1 = m(x - x_1)$ or ignoring the intercept altogether. Other items for this standard may ask students to identify the graph or equation of a line given a point and a slope, or a slope and a *y*-intercept.

SAMPLE QUESTION 7

Strand: II. Linear Functions

Substrand: C. Equations and Inequalities

Standard: 1. Analyze situations involving linear functions and formulate linear equations or inequalities to solve problems.

7. The cost of renting a table at a flea market is based on a fixed price per day plus an initial registration fee. If it costs \$45 to rent a table for one day and a total of \$90 to rent a table for four days, which of the following equations represents the total cost (c) to rent a table at the flea market for d days?

A. $c = 15(d + 30)$

B. $c = 15d + 30$

C. $c = 15d + 45$

D. $c = 15(d + 45)$

Key: B

This item requires the student to recognize that the two values needed in the equation are the initial registration fee and the fixed price per day. Here are two approaches to this problem. The fixed price per day can be determined by finding the slope of the line segment between two points—(1, 45) and (4, 90)—which is 15. Similarly, the student may reason that the difference in total cost (c) between four days and one day is \$45 and therefore that the fixed price per day is \$15. Once the fixed price per day is found, the initial registration fee can be calculated using the total cost for one day, \$45, and subtracting the fixed price per day. In either case, students are expected to understand the relationship between the equation and the situation represented by the equation.

Common errors include not recognizing which quantities are variable and which are constant. Students often miscalculate the initial fee or use an incorrect format for their equation. Other items for this standard may require students to analyze inequalities based on problem situations.

SAMPLE QUESTION 8

Strand: II. Linear Functions

Substrand: D. Systems of Linear Equations

Standard: 1. Analyze situations and formulate systems of linear equations to solve problems.

8. A tour boat leaves the dock and travels to the wildlife park at 7 miles per hour (mph) for x hours. The return trip to the dock takes y hours at 15 mph. The boat ride takes a total of 3 hours.

Which system of equations best represents this situation?

A. $x + y = 3$
$7x = 15y$

B. $x = y$
$7x = 15y$

C. $x + y = 3$
$7x + 15y = 3$

D. $x = y$
$7x + 15y = 3$

Key: A

This item requires the student to recognize that the distance from the dock to the wildlife park is the same, whether the tour boat is coming or going. The student must realize that the distance can be determined by multiplying the rate (miles per hour) by the number of hours, an operation that produces one equation ($7x = 15y$) that represents the equal distances. Since the total time is 3 hours, the second equation is $x + y = 3$.

Common errors are misunderstanding the given information, such as not understanding that x and y can represent different times or not recognizing that distance = rate x time.

SAMPLE QUESTION 9

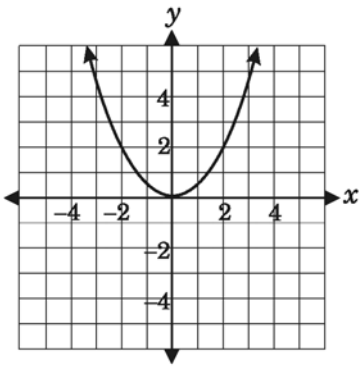
Strand: III. Quadratic and Other Functions

Substrand: A. Quadratic Functions

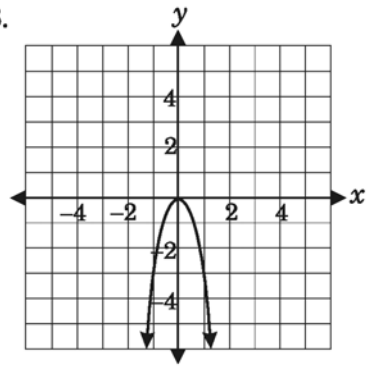
Standard: 2. With and without using a graphing calculator, investigate, describe, and predict the effects of changes in the coefficient a on the graph of $y = ax^2$.

9. Each graph below represents an equation of the form $y = ax^2$. Which graph represents the equation with the greatest value for a?

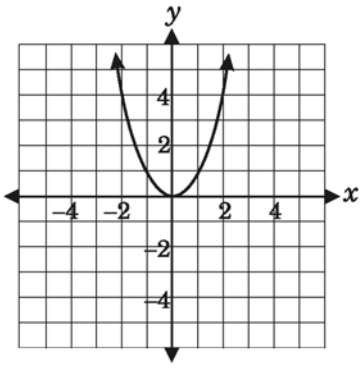
A.



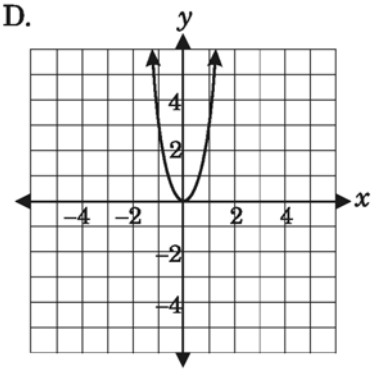
B.



C.



D.



Key: D

This item focuses on the impact of changes in the coefficient a on the graph of $y = ax^2$. The student must recognize that the larger the value of a, the steeper or narrower the graph, and that the smaller the value of a, the flatter and more open the graph.

Common errors include believing that the wider the graph, the larger the value of a, or mistaking a narrow graph that opens downward as having a large coefficient for the x^2 term. Other items for this standard may ask the student to identify a new graph based on changes to the coefficient a.

SAMPLE QUESTION 10

Strand: III. Quadratic and Other Functions

Substrand: B. Other Functions

Standard: 2. Analyze data and represent situations involving inverse variation using concrete models, tables, graphs, or algebraic methods, as well as computer algebra systems, spreadsheets, and graphing calculators.

10. **In a function, y varies inversely as x varies. If $y = 15$ when $x = 12$, what is the value of y when $x = 3$?**

A. 1.25

B. 3.75

C. 45.00

D. 60.00

Key: D

This item requires the student to formulate and use an equation based on an inverse variation relationship. If y varies inversely as x, then the product of x and y is constant as in the equation $xy = k$. Using the given information, k can be determined: $12(15) = 180 = k$. Therefore $3y = 180$ and $y = 60$.

Common errors include using a direct variation equation $\frac{12}{15} = \frac{3}{y}$ or ignoring one of the given numbers, such as $15(3) = 45$ or $\frac{15}{12} = 1.25$. Other items for this standard may require students to analyze a graph that represents an inverse variation.

PART 3

Preparing Your Students for the Examination

Here are some classroom strategies you can employ to help prepare your students for the Algebra 1/Mathematics for the Technologies 2 end-of-course examination.

A. Ensure that your instructional practices are sufficient to prepare your students for the examination by
   - incorporating ongoing cumulative review on a regular basis;
   - using realistic problems, real-world contexts, and current issues to launch instruction and apply the mathematics skills and concepts you are teaching; and
   - asking frequently in all classes such questions as these: "Why?" "How do you know?" "Can you explain your reasoning?"

B. Rather than practicing for the test, incorporate classroom assessments that probe students' understanding by
   - focusing on standards-based instruction as the key to doing well on this assessment and
   - using meaningful classroom assessments that reflect the standards you teach in your classroom.

C. Ensure that your students are sufficiently familiar with the format of the examination by
   - incorporating into your ongoing instruction various questions, exercises, and problems that are similar in format and content to the samples in this manual.

D. Ensure that your students are sufficiently motivated to take the examination by
   - sharing information about the purpose and importance of the examination and
   - sending notes home to enlist parental support for student preparation.

E. Ensure that your course outline is aligned with the examination by
   - placing appropriate emphasis on the content and process standards that are assessed and on any standards in your course outline that support the assessed standards and
   - supplementing the standard textbook with other instructional materials, particularly if specific standards are not adequately covered in the textbook.

PART 4

Raising Student Achievement Levels

You can use these teaching strategies to help raise your students' achievement level on the Algebra 1/Mathematics for the Technologies 2 examination.

A. Correlate your course outline with the standards. Become thoroughly familiar with the standards and their relationship to the course outlines for Algebra 1 and Mathematics for the Technologies 1 and 2. If certain standards are not included in your course outline but are assessed on the examination, you should incorporate those standards into your outline. Course emphasis should be placed on the Algebra 1 course standards and the algebra topics that directly tie to the standards. Recommended outlines for Algebra 1 and Mathematics for the Technologies 1 and 2 are available on-line at http://www.myscschools.com/offices/cso/mathematics/standards.htm.

B. Collaborate with other teachers in your school. Discussions with math colleagues that systematically review any inconsistencies between what is being taught and which standards are being assessed are critical for aligning curriculum and assessment. After having such discussions, teachers are able to make adjustments in what they emphasize and de-emphasize, what terms they use, and how and when they present specific aspects of the curriculum.

C. Incorporate multiple-choice questions into your unit tests and quizzes. Since students are already tested and quizzed on an ongoing basis, one of the more straightforward strategies for raising achievement is to ensure that ongoing tests and quizzes include questions that are similar to those that students will face on the end-of-course examination. Generally, well-written multiple-choice items contain as the alternative options the most common mistakes that students make. Instead of just giving your students the correct answer, take time after any test or quiz to explain why they may have selected the incorrect options.

D. Develop action plans for your department. Every school and every department is different. Strategies that are needed in one place may not be needed in another. Some schools may have already implemented and institutionalized some strategies and therefore need to focus on others. For these reasons, departments are encouraged to develop their own action plans that reflect existing conditions and needs. Written action plans with objectives, activities, timelines, and assigned responsibilities are effective ways to move forward.

Appendix

South Carolina Course Standards for Algebra 1

Domain I. Understanding Functions

A. Relationships		**5 items**
I.A.1.	Describe independent and dependent quantities in functional relationships.	
I.A.2.	Gather and record data or use data sets to determine functional (systematic) relationships between quantities.	
I.A.3.	Describe functional relationships for given problem situations and write equations, inequalities, and recursive relations to answer questions arising from the situations.	
I.A.4.	Represent relationships among quantities using concrete models, tables, graphs, diagrams, verbal descriptions, equations, and inequalities, including representations involving computer algebra systems, spreadsheets, and graphing calculators.	
I.A.5.	Make judgments about units of measure and scales within a system and between systems.	
I.A.6.	Interpret and make inferences from explicit and recursive functional relationships.	
B. Linear and Quadratic Functions and Data Representations		**5 items**
I.B.1.	Identify and sketch the general forms of linear (y = x) and quadratic (y = x2) parent functions.	
I.B.2.	For a variety of situations, identify and determine reasonable domain and range values for the given situation.	
I.B.3.	Interpret situations in terms of given graphs or create situations that fit given graphs.	
I.B.4.	Represent, display, and interpret data using scatter plots, bar graphs, stem-and-leaf plots, and box-and-whiskers diagrams, including representations on graphing calculators and computers.	
I.B.5.	Write a linear equation that fits a data set, check the model for “goodness of fit,” and make predictions using the model.	
C. Generalizations, Algebraic Symbols, and Matrices		**4 items**
I.C.1.	Read, write, and represent very large and very small numbers in a variety of forms including exponential.	
I.C.2.	Use unit analysis to check measurement computations.	
I.C.3.	Given situations, determine patterns and represent generalizations algebraically.	
I.C.4.	Use symbolic representation, reasoning, and proof to verify statements about numbers.	
I.C.5.	Recognize and justify the relationship between the magnitude of a number and the application of specific operations.	
I.C.6.	Identify and use properties related to operations with matrices (addition, subtraction, and scalar multiplication) to solve applied problems.	
D. Algebraic Expressions in Problem Solving Situations		**6 items**
I.D.1.	Find specific function values and evaluate expressions.	
I.D.2.	Simplify polynomial expressions and perform polynomial arithmetic.	
I.D.3.	Transform and solve equations and inequalities, factoring as necessary in problem situations.	
I.D.4.	Given a problem situation, determine whether to use a rough estimate, an approximation, or an exact answer. Select a suitable method of computing from techniques such as the use of mental mathematics, paper-and-pencil combinations, calculators, and computers.	

Domain I. Understanding Functions

I.D.5.	Use supporting data to explain why a solution is mathematically reasonable.
I.D.6.	Use the commutative, associative, and distributive properties to simplify algebraic expressions.

Domain II. Linear Functions

A.	**Representations**	**5 items**
II.A.1.	Determine whether or not given situations can be represented by linear functions.	
II.A.2.	Based on the constraints of the problem, determine the domain and range values for linear functions.	
II.A.3.	Translate among and use algebraic, tabular, graphical, or verbal descriptions of linear functions using computer algebra systems, spreadsheets, and graphing calculators.	
B.	**Interpretations**	**8 items**
II.B.1.	Develop the concept of slope as rate of change and determine slope from graphs, tables, and algebraic representations.	
II.B.2.	Interpret the meaning of slope and intercepts in situations using data, symbolic representations, or graphs.	
II.B.3.	With and without using a graphing calculator, investigate, describe, and predict the effects of changes in m and b on the graph of $y = mx + b$.	
II.B.4.	Graph and write equations of lines given characteristics such as two points, a point and a slope, or a slope and y-intercept.	
II.B.5.	Determine the intercepts of linear functions from graphs, tables, and algebraic representations.	
II.B.6.	With and without using a graphing calculator, interpret and predict the effects of changing slope and y-intercept in applied situations.	
II.B.7.	Relate direct variation to linear functions and solve problems involving proportional change.	
C.	**Equations and Inequalities**	**6 items**
II.C.1.	Analyze situations involving linear functions and formulate linear equations or inequalities to solve problems.	
II.C.2.	Investigate methods for solving linear equations and inequalities using concrete models, graphs, and the properties of equality; select a method and solve the equations and inequalities.	
II.C.3.	Use the commutative, associative, distributive, equality, and identity properties to justify the steps in solving equations and inequalities.	
II.C.4.	Using concrete models for given contexts, interpret and determine the reasonableness of solutions to linear equations and inequalities.	
D.	**Systems of Linear Equations**	**3 items**
II.D.1.	Analyze situations and formulate systems of linear equations to solve problems.	
II.D.2.	Solve systems of linear equations using concrete models, graphs, tables, and algebraic methods including computer algebra systems, spreadsheets, and graphing calculators.	
II.D.3.	For given contexts, interpret and determine the reasonableness of solutions to systems of linear equations.	

Domain III. Quadratic and Other Functions

A. Quadratic Functions	**5 items**
III.A.1. Given the constraints of the problem, determine the domain and range values for quadratic functions.	
III.A.2. With and without using a graphing calculator, investigate, describe, and predict the effects of changes in the coefficient a on the graph of y = ax2.	
III.A.3. With and without using a graphing calculator, investigate, describe, and predict the effects of changes in the constant c on the graph of y = x2 + c.	
III.A.4. For problem situations, analyze graphs of quadratic functions and draw conclusions.	
III.A.5. Solve quadratic equations using concrete models, tables, graphs, and algebraic methods that include factoring and using the quadratic formula as well as computer algebra systems, spreadsheets, and graphing calculators.	
III.A.6. Relate the solutions of quadratic equations to the roots of their functions.	
B. Other Functions	**3 items**
III.B.1. Use patterns to generate the laws of exponents and apply the laws of exponents in problem-solving situations.	
III.B.2. Analyze data and represent situations involving inverse variation using concrete models, tables, graphs, or algebraic methods as well as computer algebra systems, spreadsheets, and graphing calculators.	
III.B.3. Analyze data and represent situations involving exponential growth and decay using concrete models, tables, graphs, or algebraic methods as well as computer algebra systems, spreadsheets, and graphing calculators.	